# IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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| **In re Application of**: | James E. Boyle et al. | **Attorneys Docket:** | 3816.04-D3 |
| **Serial No.:** | 10/652,677 | **Confirmation No.:** | 2556 |
| **Filed:** | August 29, 2003 | **Art Unit No.:** | 3726 |
| **Examiner:** | E. Omgba | | |

**For:** "SILICON TOWER WITH INCLINED SUPPORT TEETH"

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Commissioner for Patents
Alexandria, VA 22313-1450

## APPEAL BRIEF UNDER 37 CFR §41.37

Sir:

This Appeal Brief is filed in support of the appeal of the above application dated December 27, 2005.

(i) REAL PARTY IN INTEREST

The real party in interest in this appeal is the assignee, Integrated Materials, Inc. of Sunnyvale, California.

(ii) RELATED APPEALS AND INTERFERENCES

There are no other known appeals or interferences related to this application.

(iii) STATUS OF CLAIMS

Claims 1-30 are pending and claims 1, 4-10, 13-25, and 27-30 are appealed. Claims 2, 3, 11, 12, and 26 are indicated as being allowable if rewritten to avoid rejected base claims.

(iv) STATUS OF AMENDMENTS

All amendments have been entered.

(v) SUMMARY OF CLAIMED SUBJECT MATTER

As described at page 6, line 22 to page 7, line 10, the invention includes a tower 10 of the general form illustrated in FIG. 2 and its method of making. The tower includes legs 12 joined at their ends to bases 14. Teeth 16 formed in the legs 12 are used to support plural horizontally disposed wafers in a vertically extending parallel arrangement. In preferred embodiments, the legs 12 and bases 14 are composed of silicon.

As described at page 7, lines 17-24 with reference to FIGS. 4 and 5, in one embodiment, the teeth 32 slope upwardly at an angle of between 1 and 3° and teeth ends 34 have polished horizontal portions 36 for supporting the wafer.

The method of forming the tower, which is only generally claimed in the few method claims 10-13 of the appeal, is described in detail at page 8, line 10 to page 12, line 13. The machining of the integral teeth 32 from a leg is described at page 10, line 23 to page 11, line 1, and the subsequent forming of the wafer bearing surfaces 34 on the ends of the teeth is described at page 12, lines 3-13.

(vi) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL.

Claims 1 and 8-10 stand rejected under 35 U.S.C. §103(a) as being obvious over:

Niemirowski et al. (U.S. Patent 6,056,123, hereafter Niemirowski);
Hewitt (U.S. Patent 4,504,224) ; and
Beyaert et al. (U.S. Patent 6,361,313, hereafter Beyaert).

Claims 4, 7, and 13 stand rejected under 35 U.S.C. §103(a) as being obvious over Niemirowski/ Hewitt/Beyaert and further in view of Ohsawa (U.S. Patent 6,033,215).

Claim 5 stands rejected under 35 U.S.C. §103(a) as being obvious over Niemirowski/Hewitt/Beyaert/Ohsawa and further in view of Ballance et al. (U.S. Patent 6,395,363, hereafter Ballance).

Claim 6 stands rejected under 35 U.S.C. §103(a) as being obvious over Niemirowski/Hewitt/Beyaert/Ohsawa and further in view of Wingo (U.S. Patent 6,171,400).

Claims 14, 15, 17-20, 22, 24, 25, and 27-29 stand rejected under 35 U.S.C. §103(a) as being obvious over Niemirowski in view of Hewitt, Beyaert, and Ohsawa.

Claims 21 and 30 stand rejected under 35 U.S.C. §103(a) as being obvious over Niemirowski/Hewutt/Beyaert/Ohsawa and further in view of Wingo.

Claim 23 stands rejected under 35 U.S.C. §103(a) as being obvious over Niemirowski/Hewitt/Beyaert/Ohsawa and further in view of Ballance.

Claims 2, 3, 11, 12, and 26 are indicated as being allowable if rewritten to avoid rejected parent claims.

(vii) ARGUMENT

Claims 1, 4-10, 13-25, and 27-30.-3, 6-9, 12-16 and 46

All the rejected claims stand rejected over Hewitt in combination with two or more other

references. Applicants believe the Hewitt is non-analogous art and is not properly cited.

Hewitt is non-pertinent art arising in the field of pottery which is not combinable with art in the field of semiconductor processing of the other references and of the present invention. There is a two-part test for relevant art according to *Shatterproof Glass Corp. v. Libbey-Owens Ford Co.*, 225 USPQ 634, 638 (Fed. Cir., 1985). Look first at the field of the inventor's endeavor. If the reference is not within the field of the inventor's endeavor, one looks at whether the field of the reference is reasonably pertinent to the problem the inventor is trying to solve." Clearly, pottery and silicon integrated circuits are not within same field of endeavor. The two fields are based in separate factories and rely upon different levels and types of education of their developmental staffs. Furthermore, the field of pottery is not pertinent to the problem the inventor is trying solve, which is fabricating long support fingers in a material (silicon) that is difficult to machine. The sloping fingers of the claims can be machined in a single setting of a slotter or cutting wheel and the small horizontal support areas can then be machined by a single setting of the polishing wheel or other polishing mechanism. Similarly, the prior art of support towers typically made of quartz or silicon carbide typically forms integral teeth in the support legs. In contrast, the kiln furniture of Hewitt and presumably other prior art in the pottery field are not made of silicon or other high-purity materials such as fused quartz and silicon carbide. No reasonable engineer attempting to improve on semiconductor support towers would look into the field of pottery kilns to investigate adopting some practices of potters. Pottery kiln furniture is not reasonably pertinent to any problem that a semiconductor processing engineer is trying to solve, particularly an engineer working with silicon towers of the invention or of Niemirowski or Beyaert.

Stated differently, ordinary mechanics in the field of thermal batch processing of integrated circuits who read the prior art of Niemirowski and Beyaert are unlikely to futher consult the prior art of pottery kilns, which art produces particulates far in excess of the minimum levels needed for integrated circuits.

The Examiner seems to accept that Hewitt is not in the field of applicant's endeavor, but

he then attempts to show that Hewitts is pertinent to the problem of thermal shadowing addressed by the present invention by reducing the area of contact of the support surfaces. He cites *In re Oetiker*, 24 USPQ2d 1443 (Fed. Cir., 1992), which contains an equivalent statement of the requirement of analogous art, *ibid.*, 1445. This interpretation is based on a misconstrued reading of Hewitts. Hewitt is directed to the general problem of inexpensive and repairable pottery ware setter (pottery stands). His replaceable upwardly sloping triangular section pins 24 (col. 2, ll. 44-56) are directed to the specific problem of point contact between the pin and the ceramic ware to "minimize the area of contact ... which remains visible in the finished ware." As he explains at col. 1, ll. 48-50, glaze spray is used which sticks to the exposed surfaces. Hewitt's point contact support of pottery ware, which avoids avoid glaze blemishes of the fired pottery, is not pertinent to thermal processing of silicon wafers or to the thermal shadowing addressed by the inventor. Silicon processing does not involve the use of a spray glaze and is not concerned with cosmetic defects on the wafer backside. *Oetiker* requires that there be reasonable motivation for the inventor "to go into the field in which the examiner found the reference, in order to solve the problem confronting the inventor." *ibid.*, 1446. As stated previously, a silicon processing engineer would not consult the pottery literature for problems faced in the fabrication of advanced silicon integrated circuits.

Yet further, *Oetiker* found that the Examiner must exercise "common sense in deciding in which fields a person or ordinary skill would reasonably be expected to look for a solution to the problem facing the inventor." , *ibid.*, 1446. *Oetiker* found against the Examiner. In particular, garment fasteners were held not analogous to hose clamps. Applicants believe pottery ware setters are similarly not analogous to wafer towers and it is not common sense for a semiconductor engineer to search the pottery art

Even further, *Oetiker* forbids the Examiner from using the inventor's teaching to support the analogous art conclusion, as the Examiner has done here by citing the problem of thermal shadowing taught by the inventor. "That knowledge can not come from the applicant's invention itself." *ibid.*, 1446.

While *Keller* 208 USPQ 871 (CCPA, 1981) can be cited for the holding that obviousness is based on what the combined teachings prior art suggest to the ordinary mechanic, the prior art must suggest the claimed invention not the individual elements of the claimed invention without any suggestion of combining them.

Claims 1 and 8-10

Even if Hewitt is considered analogous art, it is unobvious to substitute the triangular pins of Hewitt for the slots in the rails 5 of Niemirowski or the divider 13' of Beyaert. Both Niemirowski and Beyaert use teeth that are integral with their legs. Hewitt at col. 2, lines 51-56 explains that the shape and slope of his pins 24 causes the pins 24 to support the flatware at point contacts, thereby minimizing the visible contact point in the glazed surface on the bottom of the flatware. Absent Hewitt's glazing spray, there is no reason for his point contact and upwardly sloping triangular pins. There is no comparable need to minimize to a point the contact area on the back side of semiconductor wafers to avoid cosmetic damage or even to prevent backside deposition on the contact areas Niemirowski is shown to provide a large contact area while Beyaert already provides a minimum contact at his contact corner S' in FIG. 4B. The simple inclined form of Hewitt's pins is probably dictated by their need to be replaced after each firing (col. 2, lines 57-61) and hence the need for them to be simple and inexpensive while providing point contact. Hewitt's teaching is limited to the upward sloping of triangular pins to achieve point contact.

It is possible that Hewitt's replaceable triangular pins could be substituted in the silicon tower of Niemirowski, but there is no suggestion for it and the combination is not read upon by the claims. There is simply no suggestion in the art for the advantages of substituting Hewitt's triangular pins or their shape or inclination into the prior art of Niemirowski and Beyaert. Hewitt's inclination of his pins is based upon their triangular shape thereby providing point contact. These two closely associated features cannot be separated without some further suggestion in the art.

Yet further, the prior art simply fails to teach teeth integral with legs and having both upper and lower surfaces at 1° to 3°. Hewitt's teeth don't have parallel upper and lower surfaces and his support is on the end of the triangular apex, not an upper cut surface. It is difficult to imagine triangular teeth being cut into Hewitt's legs or pillars 12. Beyaert's teeth are inclined only on one side. Niemirowski's teeth are not inclined. The claimed invention provides for easily machinable and closely spaced support teeth.

Claim 10

As for method claim 10, the applied art fails to disclose cutting inclined parallel slots at the requisite 1 to 3° angle. Hewitt's triangular shape is not amenable to cutting into his legs or pedestals 12. Niemirowski's slots are not inclined. Beyaert's method described at col. 6, ll. 17-24 includes first cutting horizontal slots and then using a specially shaped saw blade 23 of FIG. 5 to shape the single inclined face of the final slot. Beyaert's description at col. 6, ll.11-17 is not understood since the described method does not produce the illustrated shape. It is possible that he is beginning with the prior art horizontal divider 13 of FIG. 1B and further shaping its upper edge with a tilted saw blade to arrive the shape of FIG. 4B.

Claims 4, 7, and 13

First, these claims depend from a claim believed to be in allowable form. Secondly, the only reason Hewitt provides for the inclination of his pins is to provide a point contact support of the pottery ware being fired and supported on the tip of the triangular pins and to minimize visible pits in the glazing. Beyaert teaches the advantage of a line contact. Oppositely, Niemirowski teaches a completely flat upper surface and Ohsawa teaches the advantages of a flat extended support surface but both Niemirowski and Ohsawa lack the inclined upper and lower surfaces. The Examiner needs to pick which teaching he is using and adapt the teaching as a whole instead of selectively combining only parts of disparate teachings. The inclined surfaces as they exist in Hewitt and Beyaert are designed to provide either point or line contact, not the

perpendicularly extending support surfaces of the present claims.

Claims 5 and 6

Claims 5 and 6 depend upon a claim believed to be in allowable form and should therefore also be allowable.

Claims 14, 15, 17-20, 22, 24, 25, and 27-29

The unobvious use of Hewitt's triangular pins with point contact in combination with the semiconductor art of the other references has already been argued. The same set of references has been discussed in regards to claim 4 for much the same claimed structure. The art simply fails to suggest support teeth having parallel surfaces (claim 24) or upper and lower surfaces (claim 14) inclined at no more than 3° with horizontally extending support surfaces formed at their upper ends.

Claims 21 and 30

Claims 21 and 30 depend from claims believed to be in allowable form and should therefore also be allowable.

Claim 23

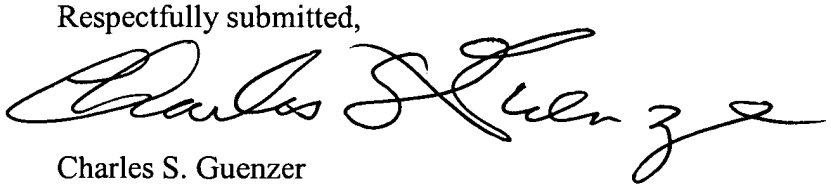
Claim 23 depends from a claim believed to be in allowable form and should therefore also be allowable.

CONCLUSION

Accordingly, base claims 1, 10, 17, and 24 and all claims dependent therefrom should be held allowable. Dependent claims 4, 7, and 13 should be held additionally allowable. The Board is respectfully requested to instruct the Examiner to allow these claims.

Date: 21 March 2006

Respectfully submitted,



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CLAIM APPENDIX

1. A wafer support tower for supporting wafers in parallel spaced relationship along a vertical axis, comprising:

two silicon bases;

a plurality of silicon legs joined at opposite ends to said two bases; and

a plurality of teeth having upper and lower surfaces both cut into said legs and extending outwardly from axially extending portions of said legs at an upwardly sloping angle of between 1° and 3° with respect to said vertical axis to support said wafers on upper sides of distal ends thereof.

4. The tower of Claim 1, wherein support surfaces extending perpendicularly to said axis are formed in said distal ends to support said wafers.

5. The tower of Claim 4, wherein said support surfaces are polished.

6. The tower of Claim 4, wherein said support surfaces support said wafers at places located at between 69% and 72% of a radius of said wafers.

7. The tower of Claim 4, wherein said teeth have a generally wedge shape with said support surfaces being formed in a narrower side of said wedge shape.

8. The tower of Claim 1, wherein said teeth have a generally wedge shape with said distal ends being located in a narrower side of said wedge shape.

9. The tower of Claim 1, wherein said plurality of legs consists of either three or four of said legs.

10. A method of fabricating a silicon support tower, comprising the steps of:

in each of a plurality of silicon legs extending along a first axis, cutting a plurality of parallel slots to form teeth therebetween inclined at an angle of between 1° and 3° to a first side of said teeth with respect to a perpendicular to said first axis; and

joining opposite ends of said plurality of silicon legs to respective ones of two silicon bases to allow said teeth to support a plurality of wafers on said first sides thereof.

13. The method of claim 10, further comprising forming support surfaces extending perpendicularly to said first axis on said first sides of said teeth at distal ends thereof.

14. A support tower for supporting wafers in parallel spaced relationship along a vertical axis, comprising:

two bases;

a plurality of legs joined at opposite ends to said two bases and disposable along said vertical axis;

a plurality of support teeth formed in said legs to have upper and lower sloping surfaces both extending outwardly from axially extending portions of said legs and sloping upwardly at a predetermined finite angle of no more than 3° with respect to said vertical axis; and

support surfaces extending perpendicularly to said vertical axis formed in said upper sloping surfaces at distal ends of said support teeth to support said wafers thereon.

15. The tower of Claim 14, wherein said bases and legs are formed of silicon members.

16. The tower of Claim 15, wherein said legs are formed of virgin polysilicon members.

17. The tower of Claim 14, wherein said legs are formed of quartz members.

18. The tower of Claim 14, wherein said legs are formed of silicon carbide members.

19. The tower of Claim 14, wherein said angle is at least 1°.

20. The tower of Claim 19, wherein said bases and legs are formed of silicon members.

21. The tower of Claim 14, wherein said support surfaces support said wafers at places located at between 69% and 72% of a radius of said wafers.

22. The tower of Claim 14, wherein said teeth have generally wedge shapes with said distal ends being located in a narrower side of said wedge shapes.

23. The method of Claim 13, wherein said step of forming said support surfaces includes polishing portions of distal ends of said inclined teeth in a plane perpendicular to said first axis.

24. A support tower for supporting substrates in parallel spaced relationship along a vertical axis, comprising:

two bases;

a plurality of legs joined at opposite ends to said two bases and disposable along said vertical axis; and

a plurality of support teeth formed in said legs to have parallel inclined upper and lower surfaces sloping upwardly from axial portions of said legs at a predetermined finite angle of no more than 3° with respect to a perpendicular of said vertical axis except for horizontal surfaces extending perpendicularly to said vertical axis formed only in said upper sloping surfaces and configured to support said substrates.

25. The tower of Claim 24, wherein said bases and legs are formed of silicon members.

27. The tower of Claim 24, wherein said legs are formed of quartz members.

28. The tower of Claim 24, wherein said legs are formed of silicon carbide members.

29. The tower of Claim 24, wherein said angle is at least 1°.

30. The tower of Claim 24, wherein said horizontal surfaces support said substrates at places located at between 69% and 72% of a radius of said substrates.